

WEATHER RESISTANCE TESTER

FIELD OF THE INVENTION

The present invention relates to weather resistance testers, and more particularly to an apparatus for testing plastics, coating compositions, inks, pigments, fibers, etc. for weather resistance under conditions involving a condensation condition.

RELATED ART STATEMENT

Plastic materials, coating compositions and the like have heretofore been tested for weather resistance (lightfastness) generally by testers according to JIS B 7751-7754. Such testers usually include a carbon arc lamp, xenon arc lamp or like light source for irradiating samples with its light to perform accelerated weather resistance tests.

With these testers, however, the intensity of ultraviolet (U.V.) rays for irradiating the sample is generally about 6 mW per square centimeter of the surface to be exposed, such that the tester requires at least several hundreds of hours for determining U.V. deterioration characteristics corresponding to those resulting from a one-year exposure to sunlight.

Since it is common practice to test all the samples of individual lots, the testing procedure also requires a long period of time for determining the characteristics and evaluating the results and therefore involves the problem of extremely low efficiency.

This problem will be overcome, for example, by exposing the samples of individual lots to very intensive U.V. rays before testing for weather resistance to effect accelerated U.V. deterioration, selecting the samples to be tested from among the exposed samples according to the degree of deterioration and thereafter testing only the selected samples by the weather resistance tester. This eliminates the need to test all the samples by weathering, leading to a greatly improved testing efficiency.

We have already proposed an apparatus for pretesting the samples of individual lots before the usual weathering test, by exposing the samples to U.V. rays having a high intensity, for example, of at least about 50 mW/cm² with a metal halide lamp, whereby the samples can be checked for U.V. deterioration within a very short period of time, e.g., within up to 1/10 of the time conventionally required (see Unexamined Japanese Patent Publications SHO 60-117128 and SHO 60-117129). The pretesting apparatus is of course usable also as a weather resistance tester.

It is desired that the weathering test for plastics, coating compositions or like materials be conducted, to the greatest possible extent, under the same physical conditions as those to which the material is subjected during actual use. In the nighttime, the material in use is not only exposed to low temperatures due to the absence of sunlight but is also likely to be exposed to the condensate of water vapor.

If the conditions for the weathering test or pretesting therefor involve such a condensation condition, the result obtained will serve to provide a commercial product of improved quality as demanded by the community.

Examined Japanese Patent Publication SHO 65 55-13541, for example, proposes to dip the sample in water in order to subject the sample to such a condensation condition. The dipping method nevertheless in no

way realizes the actual state of condensation, nor can it be a substitute therefor.

In view of this drawback, we thought it useful to adjust the temperature of the sample and the temperature and humidity of the air surrounding the sample in subjecting the sample to the actual condensation condition, and investigated whether our proposed apparatus for weathering test or pretesting could be so adapted without impairing the acceleration characteristics of the weathering test.

The condensation of water vapor is dependent generally on the temperature and the humidity. Our investigations have revealed that even if a condensate of water vapor can be deposited on the sample, some components of the apparatus other than the sample are then likely to be under the same temperature and humidity conditions as the sample, consequently becoming fogged up on condensation or locally permitting deposition of dust or the like thereon due to drops of water condensate. Thus, the condensation of water vapor is liable to produce various objections.

Especially when the cooling water jacket or reflector (mirror) for the metal halide lamp is subjected to condensation, there arises the problem that the sample will not be fully exposed to the U.V. radiation (smaller than 400 nm in wavelength, 10 to 30% of the total quantity of light) which is essential to the acceleration of weathering. While the weather resistance tester disclosed in Patent Publication No. SHO 55-13541 mentioned above has incorporated therein a xenon lamp which is originally low in the intensity of irradiating U.V. radiation (less than 400 nm in wavelength, 3.25% of the total quantity of light), the tester is totally unable to perform weathering tests in any accelerated mode if locally exposed to the condensate of water.

SUMMARY OF THE INVENTION

The present invention provides a weather resistance tester comprising:

- (a) a U.V. radiation source comprising a lamp for generating U.V. radiation,
- (b) a reflector having the U.V. source accommodated therein and an opening at its lower portion for permitting the lamp to project U.V. radiation downward through the opening,
- (c) a shield panel provided in the opening of the reflector and closing the opening for transmitting U.V. radiation therethrough and substantially blocking water vapor,
- (d) a sample support disposed below the opening,
- (e) temperature adjusting means provided for the sample support,
- (f) a compartment having accommodated therein the U.V. source, the reflector, the shield panel, the sample support and the temperature adjusting means,
- (g) a duct having an intake portion and an outlet portion connected to the compartment and provided with a heat exchanger and means for blowing air,
- (h) a humidifier in operative relation with the sample support for providing a condensation condition therearound; and

(i) control means for giving operational instructions to the U.V. source, the temperature adjusting means, the heat exchanger, the blower means and the humidifier to maintain a sample on the sample support at a predetermined temperature while the lamp is on and to